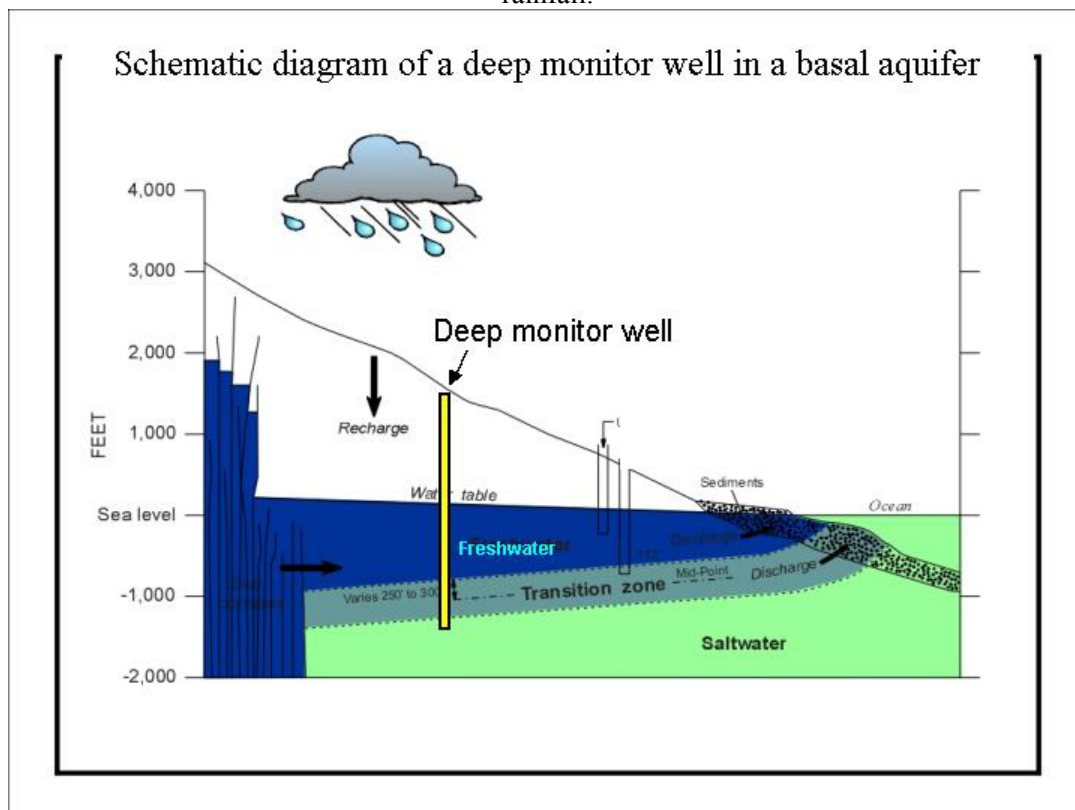


COMMISSION ON WATER RESOURCE MANAGEMENT DEEP MONITOR WELL PROGRAM

Introduction

Hawaii's unique volcanic geology provides for large aquifers (water bearing rock) that are able to support the State's population by supplying potable ground water as well as water for agricultural and other purposes. These aquifers are replenished by rainfall. Because fresh ground water is slightly less dense than seawater, it floats on top of the saline water forming what is known as a Ghyben-Herzberg lens, which is referred to as a "basal" aquifer. Theoretically, for every foot of fresh water above sea level, there is 40 feet of fresh water below sea level. Between the fresh-water and salt-water portions of the lens is a zone of mixing, known as the "Transition Zone."

In Hawaii, the chloride ion concentration (milligrams per liter or mg/L) is used to determine the freshness or saltiness of ground water. It is also listed as a contaminant in the EPA Secondary Drinking Water Regulations. Chloride in small concentrations is not harmful to humans, but in concentrations above 250 mg/L, or 2 percent that of seawater, it imparts a salty taste in water that is objectionable to many people. By definition, the Transition Zone is water greater than 250 mg/L chloride (TTZ) to the mid-point concentration of 9,500 mg/L chloride (MPTZ), which is 50 percent of seawater. Below the mid-point, concentration increases to sea water at 19,000 mg/L chloride. Because the amount of water that can be developed from a freshwater lens for potable use is constrained by the salinity of the water, the altitude of the top of the transition zone (where chloride concentration is 2 percent that of seawater) and the thickness of the transition zone are important. The transition zone is in constant flux, responding to changes caused by variations in pumping and rainfall.



What is a Deep Monitor Well?

A deep monitor well penetrates the entire water column from fresh water into the salt water. Data collected from the well are used to track the change and movement of the Transition Zone over time. This can be accomplished either by direct sampling at discrete elevations (below mean sea level) or by lowering an instrument known as a CTD that measures changes in the electrical conductance, temperature, and depth of the water as it is lowered to the bottom of the well. The saltier the water, the more conductive it is.

As one travels inland, the water levels increase, and therefore, the elevation of the mid-point below mean sea level would also increase. Ideally there should be three deep monitor wells in each aquifer system, situated in a way as to provide a mountain to seaward (mauka to makai) line or cross-section through the basal aquifer.

CWRM Deep Monitor Wells

Commission staff monitors and logs four deep monitor wells on Oahu on a quarterly schedule. All of these wells are located within the Pearl Harbor Aquifer Sector, which encompasses the Waimalu, Waipahu-Waiawa, and Ewa-Kunia Aquifer Systems. The Pearl Harbor Aquifer Sector is the most important potable aquifer in the State of Hawaii, supplying the majority of the drinking water for the island of Oahu. The Halawa Deep Monitor Well is located above Halawa Medium Security Prison in the Waimalu Aquifer System. At the present time, the Commission is drilling a second deep monitor well in the Waimalu Aquifer System, the Waimalu Deep Monitor Well, located in Waimalu Valley. The Waipio-Mauka Deep Monitor Well, near Mililani Cemetery, and the Waipahu Deep Monitor Well below the old sugar mill; are located in the Waipahu-Waiawa Aquifer System. No new deep monitor wells are planned for Waipahu-Waiawa. The Kunia-Middle Deep Monitor Well is located west of Kunia Road in the Ewa-Kunia Aquifer System. Construction of a second deep monitor well for the Ewa-Kunia Aquifer System, the Kunia-Mauka Deep Monitor Well situated about a mile northeast of the existing Kunia-Middle Deep Monitor Well, is in progress.

On Maui, Commission staff logs two deep monitor wells roughly three times a year. The Waiehu Deep Monitor Well is situated in the Iao Aquifer System, which is heavily tapped and showing signs of overpumpage. The Mahinahina Deep Monitor Well is located near Lahaina, an important and expanding tourist destination on the dry leeward side of the island. The Commission is currently drilling another deep monitor well in Iao Aquifer System south of Iao Stream, and is planning a new well in Waihee Aquifer System, which is adjacent to and in communication with the Iao Aquifer System.

The Commission staff also logs two deep monitor wells on the island of Hawaii. Both of the wells are located near Kailua-Kona. The Kahaluu Deep Monitor Well is located seaward of the Kahaluu Shaft and reflects conditions encountered where no caprock exists. The Keopu Deep Monitor Well is unusual in that the expected basal conditions were not encountered, but water levels are much higher than expected. At the present time there are no plans to drill additional deep monitor wells on the island of Hawaii.